PART I - ADMINISTRATIVE

Section 1. General administrative information

Title of project	
Evaluate Salmon Supplementation in Idaho Rivers (ISS)	
BPA project number	**8909801**
Contract renewal date (mm/yyyy)	**01/2000**
Multiple actions? (indicate Yes or No)	**Yes**
Business name of agency, institution or organization requesting funding	
U.S. Fish & Wildlife Service - Idaho Fishery Resource Office	
Business acronym (if appropriate)	**USFWS-IFRO**
Proposal contact person or principal investigator:	
Name	**Jill M. Olson**
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NPPC Program Measure Number(s) which this project addresses	
7.3B.2, 7.0A, 7.1B.1, 7.1C3, 7.2A	
FWS/NMFS Biological Opinion Number(s) which this project addresses	
ESA Section 10 permits, Federal Land Management NEPA compliance	
Other planning document references	
4.5C., 4.1, 4.1B, 4.2 - NMFS Snake River Salmon Recovery Plan, Wy Kan Ush Me Wa Kush Wit 5B pages 14-23	
Short description	
Evaluate various supplementation strategies for maintaining and rebuilding spring/summer chinook salmon populations in Idaho. Develop recommendations for the use of supplementation to rebuild naturally spawning populations.	
Target species	
Spring / Summer Chinook Salmon (Oncorhynchus tshawytscha)	

Section 2. Sorting and evaluation

Subbasin
Clearwater River, Salmon River

Evaluation Process Sort

CBFWA caucus		CBFWA eval. process		ISRP project type	
X one or more caucus		If your project fits either of these processes, X one or both		X one or more categories	
X	Anadromous fish	X	Multi-year (milestone-based evaluation)		Watershed councils/model watersheds
	Resident Fish		Watershed project eval.		Information dissemination
	Wildlife				Operation & maintenance

			New construction
		X	Research & monitoring
			Implementation & mgmt
			Wildlife habitat acquisitions

Section 3. Relationships to other Bonneville projects

Umbrella / sub-proposal relationships. List umbrella project first.

Project #	Project title/description
20545	Salmon Supplementation Studies in Idaho Rivers (ISS)
8909800	Idaho Dept. of Fish and Game Cooperator on ISS Study
8909801	U.S. Fish and Wildlife Service Cooperator on ISS Study
8909802	Nez Perce Tribe Cooperator on ISS Study
8909803	Shoshone-Bannock Tribes Cooperator on ISS Study

Other dependent or critically-related projects

Project #	Project title/description	Nature of relationship
9005500	Steelhead Supplementation Studies	Reciprocal transfer of data/coordination
8335000	Nez Perce Tribal Hatchery- O&M	Reciprocal transfer of data/coordination
9405000	Salmon River Habitat Enhancement - O&M, M&E	Reciprocal transfer of data/coordination
9705700	Salmon River Production Program	Reciprocal transfer of data/coordination
9703000	Monitor Listed Stock Adult Chinook Salmon Escapement	Reciprocal transfer of data/coordination
9102800	Monitoring Smolt Migration of Wild Snake River Spring/Summer Chinook Salmon	Reciprocal transfer of data/coordination
9604300	Johnson Creek Artificial Propagation Enhancement- O&M, M&E	Reciprocal transfer of data/coordination

Section 4. Objectives, tasks and schedules

Past accomplishments

Year	Accomplishment	Met biological objectives?
1991	Identified study areas, brood stocks, facilities to be used.	Yes. Begin preliminary baseline data collection on treatment and control streams, target stock history, genetic sampling.
1992	Begin supplementation and monitoring of treatment streams, and monitoring of control streams.	Yes. Initiated parr and smolt releases for treatment streams. Used existing hatchery brood stocks for first generation supplementation.
1995	Annual Report for 1991-93 Pete King and Clear creeks. USFWS.	Yes. Summary of standardized protocols and baseline measurements. Continued monitoring of treatment streams, juvenile populations, and adult escapement.
1996	Small scale investigations into chinook salmon supplementation strategies and techniques: 1992-1994. Technical Reports. Perry, C.A. and T.C. Bjornn.	Yes. Completed small scale studies to monitor behavioral interactions between natural and hatchery fish.

1997	First generation returns, a known brood stock for supplementation is established.	Yes. Brood stock selection begins with local stocks of known components.
1997	Initiated radio telemetry study to monitor adult movement and identify spawning locations of adults released above weir.	Yes. Tracking has given us a better idea of the behavior of adult spawners after releasing them above the weir. It also allows us to monitor their spawning success.
1998	Five-year Report (1992-1997) in progress.	Yes. Summarize baseline data, review methodology, continue supplementation of treatment streams and monitoring of control streams, continue monitoring of juvenile survival and abundance, and monitoring of adult returns.

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Monitor and evaluate the effects of supplementation on parr, pre smolt and smolt numbers, and spawning escapements of naturally produced salmon.	a	Continue to implement "standardized" spawning, rearing, marking, and release protocols.
1		b	Differentially mark all hatchery supplementation and general production fish released in or nearby the study streams.
1		c	PIT tag a minimum of 700 hatchery supplementation and general production fish released in or nearby the study streams.
1		d	Release various life stages of chinook salmon. Determine fish numbers for each life stage based on existing natural production and natural rearing capacity.
1		e	Estimate late summer parr densities from snorkel surveys.
1		f	PIT tag a minimum of 700 naturally produced parr from each treatment and control stream to estimate smolt production and survival.
1		g	Use existing weirs to collect, mark (PIT tag), and enumerate emigrating fish and to identify and enumerate returning adults.
1		h	Compare natural production of supplemented populations to unsupplemented populations and baseline data.
2	Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation	a	Monitor productivity and genetic indices from supplemented populations and compare baseline and controls. Productivity characteristics will be evaluated as a function of density or percent carrying capacity to minimize density dependent effects confounding treatment effects.
2		b	Monitor straying of hatchery supplementation fish into adjacent and control streams by weirs and carcass surveys.
2		c	Determine spawner to recruitment relationship

Obj 1,2,3	Objective	Task a,b,c	Task
			based on determined production and productivity indices (parr and smolt numbers, adult escapements, survival, eggs/spawner etc.).
2		d	Predict population viability based on spawner to recruitment relationship to determine if the population will maintain itself through time in the absence of additional supplementation.
3	Determine which supplementation strategies (brood stock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity. (Long term)	a	Monitor and evaluate natural production (pre smolt, Smolt and adult numbers) and productivity (survival, life stage characteristics, pathogens, straying, genetic composition) of supplemented populations and compare to baseline and controls.
3		b	Use local brood stocks with known natural component from the target population during the second generation of supplementation.
3		c	Compare natural production and productivity indices of supplemented populations using existing hatchery brood stocks (first generation) to populations using locally developed brood stocks (second generation).
3		d	Compare natural production and productivity indices among supplemented populations using parr, pre smolt, and smolt release strategies.
4	Develop supplementation recommendations. (Long term).	a	Guidelines and recommendations will be developed addressing risks and benefits of supplementation (augmentation and restoration) in general and specific supplementation strategies (brood stock and release stage).

Objective schedules and costs

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
1	05/1992	12/2007	Evaluation of supplementation effects on numbers of presmolt and smolt, and spawning escapements of naturally produced salmon.	X	34
2	05/1992	12/2007	Evaluate increases or decreases in number of naturally produced salmon. Evaluate genetic composition of target and adjacent populations following supplementation.	X	32
3	05/1992	12/2007	Determine which brood stock and release stage result in the quickest and highest (if any) increase in natural production, without adversely effecting the productivity.	X	34

Obj #	Start date mm/yyyy	End date mm/yyyy	Measureable biological objective(s)	Milestone	FY2000 Cost %
4	01/1999	09/2007	Supplementation recommendations completed in final study report.	X	0
				Total	100

Schedule constraints
The continued decline of spring/summer chinook salmon returning to Idaho result in insufficient adult returns to provide target supplementation treatments.
Completion date
2015

Section 5. Budget

FY99 project budget (BPA obligated):	$147,344.00

FY2000 budget by line item

Item	Note	% of total	FY2000 ($)
Personnel		38	49,654
Fringe benefits		10	13,200
Supplies, materials, non-expendable property	field gear (boots, waders, etc.), bait, batteries, yagi antenna, radio tags(25)	7	8,500
Operations & maintenance	trap repairs, vehicle rental, gas	7	8,400
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		0	0
NEPA costs		0	0
Construction-related support		0	0
PIT tags	# of tags: 2100 @ $2.90each	5	6,090
Travel	coordination meetings, training	2	3,000
Indirect costs	USFWS Overhead @34.2%	25	33,121
Subcontractor	backhoe(8hrs), trap operator (900hrs)	6	8,000
Other			
		TOTAL BPA REQUESTED BUDGET	129,965

Cost sharing

Organization	Item or service provided	% total project cost (incl. BPA)	Amount ($)
		Total project cost (including BPA portion)	

Outyear costs

	FY2001	FY02	FY03	FY04
Total budget	140,000	140,000	140,000	140,000

Section 6. References

Watershed?	Reference
	Northwest Power Planning Council (NPPC). 1987. Columbia River Basin Fish and Wildlife Program. Portland, Oregon.
	Northwest Power Planning Council (NPPC). 1994. Columbia River Basin Fish and Wildlife Program. Portland, Oregon.
	Regional Assessment of Supplementation Project (RASP). 1991. Draft status report for review and comment. Prepared for Bonneville Power Administration PJSP, Portland, Oregon.
	Scheaffer, R.L., W. Mendenhall, and L. Ott. 1979. Elementary survey sampling, 2nd edition. Duxbury Press, North Scituate, Massachusetts.
	Smith, S.G., J.R. Skalski, J.W. Schlechte, A. Hoffman, and V. Cassen. 1994 SURPH.1 Manual. Statistical survival analysis for fish and wildlife tagging studies. Developed for the Bonneville Power Administration. University of Washington, Center for Quantitative Science.
	ISS Project Reports
	Bowles, E. and E. Leitzinger, 1991. Salmon Supplementation Studies in Idaho Rivers. Experimental Design to the U.S. Department of Energy, Bonneville Power Administration. Project No. 89-098. Contract No. DE-B179-89BP01466.
	Salmon Supplementation Studies in Idaho Rivers- Five year summary report. (In progress 1999).
	Peery, C.A., and T.C. Bjornn. 1996. Small-scale investigations into chinook salmon supplementation strategies and techniques: 1992-1994. Technical Reports 96-3 ICFWRU, University of Idaho. IDFG and BPA, Portland, Oregon.
	IDFG Reports
	Leitzinger, E.J., K. Plaster, P. Hassemer, and P. Sankovich. 1996. Idaho supplementation studies annual progress report 1993. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration. Portland, Oregon.
	Leitzinger, E.J., K. Plaster, and E. Bowles. 1993. Idaho supplementation studies annual report 1991-1992. Fisheries Research Section, Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.
	Nemeth, D., K. Plaster, K. Apperson, J. Brostrom, T. Curet, and E. Brown. 1996. Idaho supplementation studies annual report 1994. Idaho Department of Fish and Game annual report to U.S. Department of Energy-Bonneville Power Administration, Portland, Oregon.
	Nez Perce Reports
	Arnsberg, B.D. 1993. Salmon Supplementation Studies in Idaho Rivers. Annual work summary for 1992. U.S. Department of Energy-Bonneville Power Administration. Portland, Oregon.
	Hesse, J.A., and B.D. Arnsberg. 1994. Salmon Supplementation Studies in Idaho Rivers. Annual Report- 1993. U.S. Department of Energy-Bonneville Power Administration. Portland, Oregon.
	Hesse, J.A., P.J. Cleary, and B.D. Arnsberg. 1995. Salmon Supplementation Studies in Idaho Rivers. Annual Report-1994. U.S. Department of Energy-Bonneville Power Administration. Portland,Oregon.
	Sho-Ban Reports
	Keith, R.M., M. Rowe, C.A. Reighn, J.Honena, and T. Trahant. 1996. Salmon Supplementation Studies in Idaho Rivers-Annual Report 1995. U.S. Department of Energy-Bonneville Power Administration. Portland, Oregon.
	USFWS Reports
	Rockhold, E.A., R.B. Roseberg, and J.M. Olson. 1997. Idaho Supplementation Studies Pete King and Clear creeks progress report 1991-1993. U.S. Department of Energy-Bonneville Power Administration. Portland, Oregon.

PART II - NARRATIVE

Section 7. Abstract

The goal of the Idaho Supplementation Studies Project is to evaluate the usefulness of supplementation as a recovery/restoration strategy for depressed stocks of spring and summer chinook salmon in Idaho. The project is a multi-agency effort, covering 30 streams throughout the Salmon River and Clearwater River basins, working to help define the potential role of chinook salmon supplementation in managing Idaho's natural spring and summer chinook populations, and identify genetic and ecological impacts to existing natural populations. The ISS experimental design is split into three main approaches: (1) Large scale population production and productivity studies designed to provide Snake River basin wide inferences. (2) Using study streams to evaluate specific supplementation programs. (3) Small scale studies designed to evaluate specific hypotheses. Approaches one and two measure population responses to supplementation and are long term studies. Approaches one and two measure population responses to supplementation and are long term studies. Approach three determines specific impacts of supplementation such as competition, dispersal, and behavior; and are short term studies conducted in "controlled" environments. We expect this research to demonstrate the best methods for supplementing existing natural populations of chinook salmon and reestablishing natural populations in streams where chinook have become extirpated. We expect supplementation effects and recommendations to be different for each stream. The study design called for a minimum of 15 years of research (three generations). Sampling was initiated in 1991 and implementation began in 1992. The supplementation effects will be monitored and evaluated by comparing juvenile production and survival, fecundity, age structure, and genetic structure and variability in treatment and control streams of similar ecological parameters.

Section 8. Project description

a. Technical and/or scientific background

A more detailed background is covered in the Idaho Supplementation Studies (ISS) umbrella proposal. Study streams were partitioned among four resource management entities for implementation. These included Idaho Department of Fish and Game (IDFG), Nez Perce Tribe, Shoshone-Bannock Tribes, and the U.S. Fish and Wildlife Service (USFWS) - Idaho Fishery Resource Office (IFRO). Allocations were based on interest, integration with on going programs, cost efficiency, logistics and, to a lesser extent, relative equity. Approximately one-half of the study will be implemented by IDFG through the ISS contract with BPA. The Nez Perce Tribe and Shoshone-Bannock Tribes have similar commitments to ISS, each comprising approximately 20% of the study. Both of these components rely heavily on integration of existing or proposed tribal programs. The Idaho Fishery Resource Office will contribute less than 10% of the study implementation, most coming from investigations on Clear Creek associated with evaluations of operations at Kooskia National Fish Hatchery (KNFH).

b. Rationale and significance to Regional Programs

A more thorough discussion is presented in the Idaho Supplementation Studies in Idaho Rivers umbrella proposal. The Northwest Power Planning Council (NPPC) has called "for immediate efforts to gather data on wild and naturally spawning stocks, review impacts of the existing hatchery system and coordinate supplementation activities" to achieve its goal of doubling anadromous fish runs in the Columbia Basin as addressed in the Columbia Basin Fish and Wildlife Program (FWP)(NPPC 1994). The research goals of the Idaho Supplementation Studies are to: (1) Assess the use of hatchery chinook salmon to increase natural populations of spring and summer chinook in the Salmon and Clearwater river drainages; (2) Evaluate the genetic and ecological impacts of hatchery chinook salmon on naturally reproducing chinook populations. The relationships between FWP (1994) and ISS research objectives are reviewed below:

Section 7.3B.2 - Research Objectives 1 through 3 (Implementation Phase): Implement the high priority supplementation including monitoring and evaluation, among others.

Section 7.0A - Research Objectives 1 and 3: Identify which supplementation strategies (brood stock and release stage) will be most effective in increasing natural production without adverse affects on productivity.

Section 7.1B.1 - Research Objective 2: Monitor and evaluate changes in productivity and genetic composition of target and adjacent populations following supplementation.

Section 7.1C.3 - Research Objective 2: To establish a baseline profile for evaluation and monitoring, we will include a genetic profile analysis for treatment and control streams.

Section 7.2A - Research Objectives 1 through 4: Based on the results of each of the objectives we expect to document which methods are best for supplementing existing, naturally reproducing populations of chinook salmon and reestablishing naturally producing populations in streams where they have been extirpated.

Supplementation in Idaho parallels basin wide needs and concerns as well as addressing unique concerns for upriver stocks. There are supplementation projects on going in Washington, Oregon, and Idaho. We have reviewed these projects to enhance coordination and integration with ISS and to avoid unnecessary duplication of effort. A major contributor in this effort has been our participation in the Regional Assessment of Supplementation Project (RASP). The RASP has focused on providing an overview of on going and planned supplementation activities; identifying critical uncertainties and how to technically address them; providing the framework for a "global" experimental design; and developing a model to identify realistic benefits and risks of supplementation (RASP 1991). There are also numerous supportive research or monitoring projects in Idaho that are not studying supplementation but will provide valuable data for ISS, these include IDFG, Sho-Ban Tribes, Nez Perce Tribe, US Forest Service (USFS), National Marine Fisheries Service (NMFS), Idaho Cooperative Fish and Wildlife Research Unit (ICFWRU). Supportive information includes parr density estimates, redd counts, habitat characteristics, spawning distribution and behavior, fish marking, rearing and density effects, and pathogen screening.

c. Relationships to other projects

ISS is a cooperative effort between the USFWS, IDFG, the Nez Perce Tribe, and the Shoshone-Bannock Tribes. Each cooperating agency is responsible for investigations of different streams within Idaho. All cooperators meet together to plan project activities and discuss adaptive changes necessary to maintain project relevancy and effectiveness.

Each ISS cooperator completes requirements for the National Environmental Policy Act (NEPA) with land management agencies where project activities occur on public land. Endangered Species Act (ESA) section 10 permits are also acquired through NMFS.

ISS cooperators collect a tremendous volume of data. This data is requested by other entities in the Salmon and Clearwater drainages including IDFG regions and headquarters, USFS, Bureau of Land Management (BLM), NMFS, USFWS, private landowners, hatchery managers, etc. Many entities rely on the information we collect in making management decisions.

The PIT Tag Information System (PTAGIS), administered by the Pacific States Marine Fisheries Commission, enables and assists us in the use, interrogation, and data base management of Passive Integrated Transponder (PIT) tags.

ISS works closely with the Lower Snake River Compensation Plan to coordinate on hatchery supplementation treatments.

d. Project history (for ongoing projects)

The ISS project started in 1989 as project 89098, (IDFG current project number 8909800). In 1992, the Nez Perce Tribe, Shoshone-Bannock Tribes, and USFWS-IFRO were funded to assist in the ISS project as cooperative agencies with project numbers of 8909802, 8909803, and 8909801 respectively. The University of Idaho ICFWRU was funded to conduct small scale investigations for the IDFG under the ISS study.

Publications and reports to date include the initial study design (Bowles and Leitzinger 1991), small scale studies (Peery and Bjornn 1966), and annual reports; Arnsberg (1993), Hesse and Arnsberg (1994), Hesse et al. (1995), Keith et al. (1996), Leitzinger et al.(1996), Leitzinger et al. (1993), Nemeth et al. (1996), and Rockhold et al. (1997). A five year summary report encompassing information from all project coordinators is nearing completion (1998).

ISS data addressing current population levels and life history descriptions for many of the chinook salmon (including ESA listed) producing streams in the Salmon and Clearwater drainages is being utilized in the Process for Analysing and Testing Hypothesis (PATH) process, hydro-system evaluations, and captive brood programs.

While not directly implemented for ISS, data collected on ISS PIT tagged chinook (wild/natural and hatchery origin) at Snake and Columbia River passage facilities will aid in mainstream smolt monitoring of time and passage requirements and may contribute to the management/modification of main stem dam operations. Implementation of captive brood programs including: stream prioritization, collection techniques, and monitoring and evaluating techniques will use ISS data.

The management strategy, for stocking all 1994 and 1995 brood year chinook salmon as smolts, utilized the preliminary 1992-1994 ISS data analysis which demonstrated higher minimum rates of detection at main stem fish passage facilities for smolt releases over parr and pre smolt released fish.

The ISS study results and recommendations will help guide state, tribal, and federal hatchery programs. Population characteristics including historical resiliency to low return years, life history, and genetic descriptions from baseline sampling will play a vital role in determining which supplementation strategy, if any, produces the best adult to adult to production without adverse genetic impacts to natural populations.

The USFWS has been funded for 8 years under the project 8909801. During this time our annual budgets have ranged from $73,461 to $146,344 totaling $823,740.

e. Proposal objectives

Objective 1. Monitor and evaluate the effects of supplementation on presmolt and smolt numbers and spawning escapements of naturally produced salmon.

H_{01a}: Supplementation-augmentation of existing chinook populations in Idaho does not affect natural production. Corollary: Rejecting H_{01a} indicated that supplementation can enhance or deter natural production.

H_{01b}: Supplementation-restoration utilizing existing hatchery stocks does not establish natural populations of chinook salmon in Idaho. Corollary: Rejecting H_{01b} indicates that existing hatchery stocks can be used to restore natural populations of chinook salmon in Idaho.

Objective 2. Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation.

H_{02a}: Supplementation-augmentation of existing chinook populations in Idaho does not reduce productivity of target or adjacent populations below acceptable levels (e.g. replacement). Corollary: Rejecting H_{02a} indicated that supplementation can conversely affect survival and performance of existing populations.

H_{02b}: Supplementation does not lead to self-sustaining populations at some enhanced level (e.g. 50% increase in abundance maintained over time.) Corollary: Rejection of H_{02b} indicates that certain supplementation strategies are successful in establishing self-sustaining populations or enhancing the level at which populations maintain themselves.

Objective 3. Determine which supplementation strategies (brood stock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity.

H_{03a}: Utilization of existing hatchery brood stocks in Idaho is not an effective strategy to supplement existing populations of chinook salmon within local or adjacent subbasins. Corollary: Rejection of H_{03a} indicates that development of new supplementation brood stocks for supplementation within the local or adjacent subbasin.

H_{03b}: Development of new, local brood stocks with known natural component for supplementation does not provide an advantage over utilization of existing hatchery brood stocks for supplementation within the local or adjacent subbasin. Corollary: Rejection of H_{03b} indicates that development of new supplementation brood stocks from the target populations can be more successful for supplementation than utilization of existing brood stocks.

H_{03c}: The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released. Corollary: Rejecting H_{03c} indicates which supplementation release strategies (life stages) are most effective (or least deleterious) in rebuilding natural populations.

Objective 4. Develop supplementation recommendations.

f. Methods

A more thorough explanation of the experimental design and methods for analysis has been provided in the ISS umbrella proposal as summarized from the Salmon Supplementation Studies in Idaho Rivers - Experimental Design (Bowles and Leitzinger 1991). The ISS represents a state-wide research effort incorporating treatment and control streams throughout the Salmon and Clearwater drainages. The study includes nine treatment and seven control streams in the Salmon River basin, and nine treatment and four control streams in the Clearwater River basin. The treatment and control streams have been divided among four resource management entities for implementation. Each cooperator is responsible for the activities on their respective streams. The USFWS Idaho Fishery Resource Office is responsible for the ISS project activities on Clear Creek and Pete King Creek (project # 8909801), both are located in the Clearwater basin. Clear Creek is designated as a treatment stream for supplementation of natural production evaluated with smolt releases from Kooskia Hatchery. The USFWS operates an adult weir and a rotary screw trap on Clear Creek. Pete King Creek is designated as a treatment stream for restoration of natural production evaluated with parr releases from Dworshak complex or Rapid River stock.

The specific tasks associated with their respective objective and hypotheses are presented in Section 4 and Section 8b,e,f . The following tasks will be performed in each of the study areas:

Task 1.a Continue to implement "standardized" spawning, rearing, marking, and release protocols for supplementation programs.

Task 1.b Differentially mark all hatchery supplementation and general production fish released in or nearby the study stream.

Task 1.c PIT tag a minimum 700 hatchery supplementation fish prior to release for estimating smolt-to-smolt survival.

Task 1.d Release various life stages of chinook salmon. Determine fish numbers for each life stage based on existing natural production and natural rearing capacity.

Task 1.e Estimate late summer parr densities from snorkeling surveys.

Task 1.f PIT tag a minimum of 700 naturally produced parr from each treatment and control stream to estimate smolt production and survival.

Task 1.g Use existing weirs to collect, PIT tag, and enumerate emigrating fish and to identify and enumerate returning adults.

Task 1.h Compare natural production of supplemented populations to unsupplemented populations and baseline data.

Task 2.a Monitor productivity and genetic indices from supplemented populations and compare to baseline and controls. Productivity characteristics will be evaluated as a function of density or percent carrying capacity to minimize density dependent effects confounding treatment effects.

Task 2.b Monitor straying of hatchery supplementation fish into adjacent and control streams by weirs and carcass surveys.

Task 2.c Determine spawner to recruitment relationship based on determined production and productivity indices (parr and smolt numbers, adult escapements, survival, egg/spawner etc.).

Task 2.d Predict population viability based on spawner to recruitment relationship to determine if the population will maintain itself through time in the absence of additional supplementation.

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Task 3.a Monitor and evaluate natural production (pre smolt, smolt, and adult numbers) and productivity (survival, life stage characteristics, pathogens, straying, genetic composition) of supplemented populations and compare to baseline and controls (unsupplemented).

Task 3.b Use local brood stocks with known natural component from the target population during the second generation of supplementation (differentiation of natural and hatchery returns possible through fin clips).

Task 3.c Compare natural production and productivity indices of supplemented populations using existing hatchery brood stocks (first generation) to populations using locally developed brood stocks (second generation).

Task 3.d Compare natural production and productivity indices among supplemented populations using parr, fall presmolt, and smolt release strategies.

Task 4.a Guidelines and recommendations will be developed addressing risks and benefits of supplementation (augmentation and restoration) in general and specific supplementation strategies (brood stock and release stage).

Description of proposed treatments, methods and evaluation:

Population responses to supplementation will be monitored for a minimum of one generation (5 years) following supplementation. The experimental units are the study streams themselves. Final evaluation is ideally dependent on the response of adult escapements to treatments; several interim evaluation points will be useful in indicating initial population responses and test specific hypotheses. The production response variables which we are monitoring include:

Mid-summer parr- Parr population densities are estimated in all treatment and control streams. Number of parr is estimated with standardized snorkeling techniques using stratified systematic sampling (Scheaffer et al. 1979). Parr densities are expanded by strata to estimate total parr densities within the experimental unit (treatment or control reach).

Fall and spring emigrants (presmolt and smolt)- Juvenile emigration numbers and timing are estimated with out migrant (rotary screw) traps. Traps are operated to sample the fall and spring emigration period until icing or water velocity is prohibitive. Capture efficiency is estimated by recapture of marked emigrants transported above traps. Capture efficiencies are monitored as a function of stream flow and water temperature.

Smolt production- Minimum survival estimates of smolts reaching Lower Granite Pool is estimated for all treatment and control streams. Approximately 700 juveniles are PIT tagged prior to or during emigration from the study streams and hatcheries. A similar number of hatchery fish are PIT tagged prior to release into treatment streams. Naturally produced parr and emigrants will be PIT tagged following collection by seining, minnow traps, hook-and-line, electrofishing, and/or emigration traps.

Adult escapement- Escapement to Clear Creek is determined by an adult weir located near the mouth at the Kooskia NFH. Multiple redd counts are used in Clear Creek and Pete King Creek. Potential spawning area is censussed multiple times throughout the spawning season. Potential egg disposition is estimated from fecundity of females collected at Kooskia NFH.

In addition, we are looking at the following productivity response variables:

Survival - Natural production estimates for the production response evaluation points will be used to estimate survival relationships for up to eight life stage intervals. Redd (egg)-to-parr, parr-to-smolt (at Lower Granite Pool), smolt-to-redd, and redd-to-redd survival rates will be estimated for all treatment and control populations. The survival relationships will be estimated as a function of fish numbers or density.

In-hatchery survival relationships will be monitored for egg-to-fry, fry-to-fall presmolt, and fall presmolt-to-release intervals. These survival rates will be measured as a function of density but are assumed to be predominately limited by density independent factors up to the hatchery capacities.

Fecundity - Fecundity schedules, by age and length, will be as measured from hatchery and natural fish collected for each supplementation brood stock and pooled across years within generations. Supplementation effects will be measured as trends in these fecundity schedules. Fecundity will not be monitored directly for populations in control streams.

Age structure - Age-of-return for adult male and female chinook will be determined from scales and coded-wire tags recovered from carcasses surveyed in natural spawning areas and from adults returning to weirs.
Spawning distribution - Temporal and spatial distribution of spawning will be monitored in all treatment and control streams. Run timing will be quantified directly for streams with weirs and qualitatively for study streams without weirs. Spatial distribution of spawning will be monitored by peak redd counts (ground or aerial) conducted throughout the entire study stream.

Spawning ratio - The spawning ratio will be monitored for all treatment streams. The ratio will be determined by counting marked (supplementation) v.s. unmarked (natural) adult returns at weirs followed by ground carcass surveys to estimate egg retention and prespawning mortality. This information will be analyzed directly or as a covariate to indicate spawning success and progeny survival associated with various proportions of hatchery and natural spawners.

Parr distribution and growth - Relative spatial distribution of mid-summer parr will be monitored for each treatment and control stream during snorkeling activities. Parr length during mid-summer sampling will be used to indicate growth trends.

Emigration timing - Emigration timing will be monitored for study streams with weirs and juvenile traps. This information will be used to indicate shifts in the proportion of fall and spring emigrants, and the temporal distribution of emigration within each season.

Genetic composition - Genetic structure and variability will be monitored for natural and hatchery populations associated with our research. Allelic frequencies will be monitored through starch gel electrophoresis. All inferences from genetic data will incorporate other ecological (i.e. life history, health, behavior, abundance) and environmental (i.e. carrying capacity, temperature, flows, habitat) data. This information will provide a valuable tool to assess supplementation risk and track potential genetic impacts of supplementation on long term population fitness.

Critical Assumptions:

We assume that main stem passage and flow will allow for a net replacement/increase in adult-to-adult production. Our efforts will be negated without improvements in main stem passage and acceptable water flows.

Potential Risks:

The risks associated with ISS were evaluated under the 1991 draft RASP criteria.
ISS treatment streams already have on-going hatchery programs. Consequently, ISS hatchery protocol should pose minimal ecological risk, if any, to the chinook salmon populations in these streams. Risks are primarily associated with not conducting ISS, and failing to identify and implement the best recovery measures resulting in the continued decline or extinction of the population and adversely impacting wild\natural populations through the use of inappropriate supplementation due to lack of information. The use of out-migrant traps and adult weirs impose a limited risk to individual animals in term of direct mortality and migration alteration.

Justification of Sample Size:

Sample Size requirements for determination of survival to Lower Granite Dam are estimated using the SURPH.1 (Smith et al. 1994) SAMPLE_SIZE program. Desired precision levels are established as 95% confidence intervals within ±5% of the survival estimate, using observed and detection probability rates from recent hatchery releases within the Snake River basin. Estimated minimum release groups of 800 smolts (or smolt equivalents) will be required. Sample sizes to obtain juvenile life history (timing and distribution) data are based on obtaining 50 (30 minimum) individual observations at Lower Granite Dam.

Methods for data analysis:

The methods for data analysis is explained in the ISS umbrella proposal. The Experimental Design also outlines statistical procedures to be used in data analysis. If substantive changes are made to the Experimental Design in the future, new statistical methods will be prescribed. Supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design.

Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out planted, and stream productivity.

Expected Results:

We expect this research to document the best method for supplementing existing naturally reproducing populations of chinook salmon and the best method for reestablishing naturally producing populations in streams where chinook have become extirpated. Because study streams have different ecological characteristics, supplementation effects and recommendations will likely be different for different streams.

g. Facilities and equipment

Brood stock collection and juvenile production of chinook salmon for supplementation of treatment streams uses existing hatcheries in Idaho. Treatments do not require additional production, but are coordinated and consistent forms of ongoing hatchery production. Costs associated with production of supplementation fish are covered under individual hatchery budgets.

We do adult trapping at the KNFH weir located on Clear Creek. Adult spring chinook salmon are transported either upstream for release, or to Dworshak National Fish Hatchery (DNFH) for use as brood stock. Each year biologists insert transmitters into the gullets of as many as 30 adult spring chinook. These fish are released back into Clear Creek. Two fixed-site telemetry stations have been setup to monitor movement of the adults. Biologists also monitor the movement and spawning activity of adults using manual tracking equipment. We rely on USFWS hatchery personnel and equipment for collection of adults, and transportation ISS fish. Hatchery personnel spawn the adults at DNFH and rear the offspring at KNFH using standard procedures and holding facilities currently in place. Biologists ventral clip and tag presmolts prior to their release on Clear Creek using standardized tagging methods. Parr, which are released into Pete King Creek, are tagged at the IDFG Clearwater Hatchery. Out migrant trapping is accomplished with the use of a rotary screw trap, minnow traps, seines, backpack electrofishing gear and hook-and-line fishing techniques. We use standardized PIT-tag protocol when tagging juveniles. We have one PIT-tag station which is shared by the Dworshak Fisheries Complex. We use PTAGIS to monitor emigration and survival.

h. Budget

The budget for FY 2000 is less than the budget request for FY 1999. We are not proposing any major equipment purchases . The only areas of the budget to increase are personnel and fringe benefits due to an anticipated four percent pay increase, and an increase in USFWS overhead costs. In addition toUSFWS employees, we contract for (1) full-time trap operator (900 hours), and (1) backhoe operator (8 hours).The remainder of our budget represents the costs incurred in maintaining the existing activities of monitoring and evaluation. Annually we budget for maintenance of field equipment such as rotary screw traps, (2) fixed-site radio telemetry stations and manual tracking equipment, PIT-tag scanners, and computers. Other items included are the purchase PIT tags (2,100) personal field gear such as waders, boots, wet suits, gloves and masks. Our travel budget is limited to specific training courses such as species identification and snorkeling techniques, PIT-tag operations and data retrieval, and redd walk training. The majority of the training sessions are done locally with other ISS cooperators. A portion of the travel budget is also set aside for ISS coordination meetings.

Section 9. Key personnel

(See attached resumes)

Principal Investigator:	Jill M. Olson, Fishery Biologist 1,120 hrs.
Project Duties:	Coordinate and lead field activities and data collection. Conduct tagging operations, select and spawn brood stock. Attend coordination meetings, prepare budget estimations and progress reports.
Specific Qualifications:	Six years of experience in conducting snorkel surveys, redd walks, fish collection, PIT tagging, trap operation, and data collection for ISS projects.
Project Manager:	Micheal P. Faler, Assistant Project Leader (Idaho Fisheries Resource Office) 240 hrs.

Project Duties: Provide technical supervision and guidance for field activities. Assist in field activities as needed. Assist in preparation of progress reports. Attend project coordination meetings.

Specific Qualifications: Fifteen years as both a research and management fishery biologist in the Columbia River Basin. His primary emphasis has been in chinook salmon, steelhead, and bull trout.

Section 10. Information/technology transfer

Technical information is distributed through annual progress reports for individual study sites. A five year progress report including information from all project coordinators has been completed. In 2015, a final project report will be completed. Project cooperators meet regularly to exchange information and discuss project adaptations.

ISS cooperators collect a large volume of data, and much of it is requested by numerous entities in the Salmon and Clearwater drainages including IDFG regions/headquarters, USFS, BLM, NMFS, USFWS, private landowners, hatchery managers, etc. Many entities rely on the information we collect in making management decisions. There is a tremendous amount of information transfer between ISS and other entities.

Congratulations!

Jill M. Olson

EDUCATION

Bachelor of Science— COLLEGE OF IDAHO **1985**
Major: Zoology *Minor:* General Science Teaching CALDWELL, IDAHO

EMPLOYMENT

Fishery Biologist **1995-Present**
U.S. FISH AND WILDLIFE SERVICE AHSAHKA, IDAHO

Took over as lead biologist for Supplementation Studies in Idaho Rivers (ISS) in October 1997. Responsible for collection of brood stock, transportation, spawning and rearing of ISS adults and progeny for ISS project. Design and implement radio-telemetry study on adult spring chinook salmon for monitoring movement and spawning activities. Provide logistical support such as scheduling, hiring of personnel and training of field staff. Lead field crews in the completion of snorkel and habitat surveys, operation of rotary screw traps, electro fishing, PIT tagging, redd/adult spawner surveys on Pete King and Clear creeks. Create, validate, submit and interrogate PIT tagging files using personal computers and PTAGIS software. Attend and participate in ISS coordination meetings. Assist in the preparation of the Clear and Pete King creeks progress report: 1991-1993. Prepare work plans, annual budget projections, quarterly and annual progress reports. I am also involved in the coded-wire tag (CWT) data recover and management activities including collection of biological data on hatchery rack returns, spawning records of both spring chinook salmon and summer steelhead trout, maintaining historical CWT information. I am member of both the Kooskia and Dworshak Hatchery Evaluation Team (HET).

Biological Science Technician (Fisheries) **1993-1995**
U.S. FISH AND WILDLIFE SERVICE AHSAHKA, IDAHO

Assist in parr monitoring activities such as snorkel and habitat surveys for ISS projects on Clear and Pete King creeks. Assist lead biologist in collection and PIT tagging of juvenile spring chinook salmon using out migrant traps and electro fishing equipment. Conduct redd and spawner surveys. Assist in the preparation of annual activity reports. Assist in the capture of adults and the rearing of summer steelhead trout for the ISS- Performance/Stock Productivity Impacts of Hatchery Supplementation study , project leader Reg Reisenbichler NBS.

Biological Science Technician (Fisheries) **1992**
U.S. FOREST SERVICE - INTERMOUNTAIN RESEARCH STATION BOISE, IDAHO

Lead fish habitat inventory crews in data collection for the development of "Desired Future Condition" values for anadromous streams in Idaho and Utah.

EXPERTISE

I have worked over 12 years in leading field crews in data collection for use in management of both fisheries and wildlife resources. For the past six years my work has focused specifically on anadromous fisheries of the Columbia River Basin, both the Salmon River and Clearwater River subbasins. I have skill in hatchery operations such as spawning and rearing techniques, as well as a broad knowledge of fisheries research and management. I have specific training in cryopreservation of salmonid sperm. I hold certificates in radio-telemetry and electro fishing techniques from the U.S. Fish and Wildlife Service National Conservation Training Center.

SELECTED REPORTS

Rockhold, E. Anne, R.B. Roseberg, and J.M. Olson. 1997. Idaho Supplementation Studies- Pete King and Clear Creeks Progress Report: January 1, 1991 to December 31, 1993. Bonneville Power Administration. Portland, Oregon. DE-A179-92BP49446.

Micheal P. Faler

EDUCATION

Master of Science—SOUTH DAKOTA STATE UNIVERSITY **1988**
Major: Fisheries Sciences BROO

Bachelor of Science—WESTERN KENTUCKY UNIVERSITY **1981**
Major: Biology *Minor:* Chemistry BOWI

EMPLOYMENT

Supervisory Fishery Biologist **1996-Present**
U.S. FISH AND WILDLIFE SERVICE AHSAHKA, IDAHO

First line supervisor of two biologists and one biological technician. Assist with redd surveys, juvenile enumeration, and spawning and rearing activities associated with spring chinook salmon studies in the Clearwater River, Idaho. Participate in the technical advisory team for bull trout recovery the Clearwater Basin as established for implementation of Idaho's (Governor Batt's) bull trout conservation plan. Primary investigator in the preparation of the status, distribution, and threat analysis of bull trout in the Snake River Basin, as part of the 1997 ESA listing team and development of the final rule.

Fishery Biologist **1994-1996**
U.S. FOREST SERVICE VANCOUVER, WASHINGTON

Provided program oversight and development to habitat inventory, evaluation, and restoration projects. Provided technical assistance to biologists in the development of smolt production estimates. Initiated and coordinated steelhead recovery efforts in the Wind River, Washington, and was primary investigator of a bull trout radio-tracking study in the Lewis River, Washington.

Fishery Biologist **1988-1994**
U.S. FOREST SERVICE CARSON, WASHINGTON

South Zone program manager for fisheries and hydrology resources on the Gifford Pinchot National Forest. I directly supervised the activities of 2 biologists, 1 hydrologist, and 1 technician. Worked cooperatively with other agencies and private parties in developing habitat evaluation and restoration projects for fisheries and aquatic

resources. Participated in and supervised participation in several interdisciplinary teams established to prepare NEPA documents for evaluating the environmental effects of proposed actions on Federal Lands.

Fishery Biologist **1986-1988**
U.S. FISH AND WILDLIFE SERVICE VANCOUVER, WASHINGTON

Supervised two biologists and a laborer in an off-site pen rearing program of upriver bright fall chinook salmon in Columbia River backwaters.

Fishery Biologist **1983-1986**
U.S. FISH AND WILDLIFE SERVICE-RESEARCH COOK, WASHINGTON

Primary investigator in radio-tracking study of walleye and northern squawfish in the John Day Pool. The project was part of a predation study on juvenile salmonids, and was used to help determine seasonal "closure" of population segments for the enumeration of predators in the reservoir and tailrace.

EXPERTISE—I have worked over fourteen years as both a research and management fishery biologist in the Columbia River Basin. The primary emphasis has been in chinook salmon, steelhead, and bull trout migratory behavior (adult and juvenile), habitat use, and limiting factors. I have broad knowledge and expertise in data management and writing skills, in addition to certifications in open water SCUBA diving and electro fishing through the Fisheries Academy.

SELECTED REPORTS

Faler, M.P. 1995. An Evaluation Using a Mark-Recapture Population Estimator as a Monitoring Tool for an Adfluvial Bull Trout Population. Aqua-Talk (R-6 Fish Habitat Relationship Technical Bulletin), Number 9, August, 1995.

Faler, M.P. and T.B. Bair. 1991. Migration and Distribution of Adfluvial Bull Trout in Swift Reservoir, North Fork Lewis River and Tributaries. 1991 Challenge Cost Share Report, USDA-Forest Service, Carson, WA.

Faler, M.P., L.M. Miller and K.I. Welke. 1988. Effects of Variation in Flow on Distributions of Northern Sqauwfish in the Columbia River below McNary Dam. North American Journal of Fisheries Management, 8:30-35, 1988.